

Mammal Inventories at Agate Fossil Beds, Devils Tower, Jewel Cave, and Scotts Bluff National Monuments, Mount Rushmore National Memorial, Fort Laramie, Fort Union Trading Post, and Knife River Indian Villages National Historic Sites, the Missouri National Recreational River, and Wind Cave National Park.

PRINCIPLE INVESTIGATOR:

Dr. Cheryl Schmidt (sub-contractor)
Rocky Mountain Research Station
U.S. Forest Service
1730 Samco Road
Rapid City SD 57702

PROJECT STATEMENT:

The Northern Great Plains (NGP) Network has determined that mammal inventories are needed at Agate Fossil Beds, Devils Tower, Jewel Cave, and Scotts Bluff National Monuments (NM), Mount Rushmore National Memorial (NMEM), Fort Laramie, Fort Union Trading Post, and Knife River Indian Villages National Historic Sites (NHS), the Missouri National Recreational River, and Wind Cave National Park (NP). The NGP Network made this determination based on literature reviews, documented species at the park, scoping workshops, expert opinion, and a comparison of documented species lists to expected species lists. Justification for the project is described in detail in the Northern Great Plains Inventory Study Plan (Study Plan). The Principle Investigator is required to review the Study Plan before conducting field work. The Principle Investigator is also required to contact park staff prior to conducting field work at the park (contact the Network Coordinator or see the Study Plan for a list of park contacts).

Appendix F of the Study Plan lists the mammal species documented at each of the above parks, and the species expected to be there but not yet documented. The primary purpose of the proposed field inventories is to document those species not yet documented at the parks, however, it is expected that the field inventories will also verify the current presence of already-documented species, and provide additional information on relative abundance, distribution, and habitat use.

Detailed information on the parks included in this project statement, and the status of existing inventories, can be found in the Study Plan. In summary, the status of the parks in regards to mammal inventories is:

- Agate Fossil Beds NM - about 70% documented. undocumented list is 15 species (6 bats, 6 small mammals, 3 medium sized mammals). habitat is prairie and riparian willows. 3055 acres (however, only 2,270 acres of fee land)
- Devils Tower NM - about 50% documented. undocumented list is 26 species (11 small mammals, 7 bats, 7 medium sized mammals, 1 large mammal). habitat is the Tower, ponderosa pine forest, cottonwood floodplain, river, and a prairie dog town. 1360 acres
- Fort Laramie NHS - about 50% documented. undocumented list is 28 species (10 bats, 10 small mammals, 7 medium sized mammals, 1 large mammal). habitat is wheatgrass, disturbed areas, and riverine. 833 acres
- Fort Union Trading Post NHS – about 68% documented. undocumented list is 17 species (8 small mammals, 5 medium size mammals, 3 bats, 1 large mammal). habitat is riparian woodland, riverine, and native and restored prairie. 450 acres
- Jewel Cave NM - about 50% documented. undocumented list is 26 species (11 small mammals, 9 medium sized mammals, 4 large mammals, 2 bats). ponderosa pine forest. 1355 acres
- Knife River Indian Villages NHS - about 65% documented. undocumented list is 16 species (8 bats, 5 small mammals, 3 medium sized mammals). habitat is forested floodplain and mixed-grass prairie. 1758 acres
- Missouri National Recreational River - need complete inventory. undocumented list is 49 species (21 small mammals, 19 medium sized mammals, 8 bats, 1 large mammal). habitat is upland, riparian forest, and riverine. 33,839 acres

- Mount Rushmore NMEM - need complete inventory. undocumented list is 47 species (17 small mammals, 16 medium sized mammals, 10 bats, 4 large mammals). ponderosa pine forest. 1238 acres
- Scotts Bluff NM - about 67% documented. undocumented list is 16 species (6 small mammals, 6 medium sized mammals, 4 bats). habitat is badlands juniper, mixed-grass prairie, prairie dog town, riparian cottonwood forest, riverine. 3003 acres
- Wind Cave NP – about 60% documented. undocumented list is 23 species (10 bats, 7 small mammals, 6 medium size mammals). habitat is ponderosa pine forest, mixed-grass prairie, prairie dog town. 28,295 acres

For the nine parks as a whole, 37% of the undocumented species were small mammals, 32% were medium sized mammals, 25% were bats, and 5% were large mammals. The methods proposed are designed to take advantage of this breakdown.

OBJECTIVES:

- Document the presence of those mammal species not yet documented at the parks so that at least 90% of the expected species at a park of been documented.
- Conduct the inventories in a way in which it is reasonably certain that those species not documented in the inventories are likely not at the park and may be removed from the expected species list.
- Conduct the sampling in a way that inferences can be made about the distribution and relative abundance of the mammal species of the park.
- When appropriate, acquire voucher specimens for species captured in each park (following the guidance in the Study Plan).
- To the extent possible, locate and map habitats and features of special interest to mammals (e.g., dens).
- Collect relevant supporting data (e.g., temperature).

METHODS:

Pitfall traps, live-traps, and snap traps are all commonly used for inventorying small mammals (see Wilson et al. 1996). All methods are conducive to a systematic random design (refer to the Study Plan, specifically Appendix C). A grid will be overlaid on park maps with points stratified by habitat. The Principle Investigator shall contact the Network Coordinator for vegetation maps to be used for stratification. The small size of the parks to be surveyed allow for complete grid coverage and randomization, i.e., adjustments to randomness due to accessibility will not be necessary except for the Missouri National Recreational River where access could be severely limited in some areas. Stratification for that park will need to consider accessibility and the need to make inferences across the entire park. For all parks except Wind Cave NP (only bats will be inventoried at Wind Cave NP), select “hot spots” identified by the Principle Investigator may be targeted for additional sampling effort if they are not adequately covered by the stratified random sample. The habitats to stratify by for trapping are:

- Agate Fossil Beds NM: (2) grassland, riparian/willow
- Devils Tower NM: (4) ponderosa pine, grassland, prairie dog, riparian/green ash/cottonwood
- Fort Laramie NHS: (3) riparian forest, grassland, wetland/riverine
- Fort Union Trading Post NHS: (3) riparian forest, grassland, wetland/riverine
- Jewel Cave NM: (2) ponderosa pine unburned, ponderosa pine burned
- Knife River Indian Villages NHS: (2) riparian forest, grassland
- Missouri National Recreational River: (4) riparian forest, grassland, bluffs, wetlands/riverine
- Mount Rushmore NMEM: (1) ponderosa pine forest
- Scotts Bluff NM: (3) badlands topography, grassland, riparian forest
- Wind Cave NP: (0) Wind Cave will be surveyed only for bats which will use methods note requiring stratification

Pitfall traps will be used to inventory small mammals at Devils Tower and Scotts Bluff NM, Fort Laramie and Fort Union Trading Post NHS, Missouri National Recreational River, and Mount Rushmore NMEM. Pitfall traps are especially effective at capturing shrews as well as herpetofauna (the parks listed above all have expected but undocumented shrews and herpetofauna). The Principle Investigator of the mammal study will be required to document all herpetofauna caught. Transects of pitfall traps will be randomly

located on a grid stratified by the habitats listed above with the exception of the wet habitats, the prairie dog town at Devils Tower (which receives high visitor use), and the badlands topography at Scotts Bluff NM and the bluffs at the Missouri National Recreational River (which are not conducive to the pitfall method). There will be 3 transects per habitat strata. Each transect will be at least 20m in length. Individual pitfalls will typically be spaced at 5m intervals. Drift fences at least 20cm high will be used to steer mammals into the pitfalls. Pitfalls will be unbaited, kept dry, and checked at least twice a day so animals can be released alive. Pitfalls will be used a minimum of 60 trap-nights per strata. When the study is completed the pitfall stations will be restored to their natural condition to the maximum extent possible (it is recommended that excavated material be used to refill holes). Approximately 300 hours will be spent preparing, monitoring, and restoring pitfall traps.

Live-traps and snap traps will be used at all parks except Wind Cave NP (which is conducting only a bat inventory). Recommended snap traps are Museum Specials, Victor traps, or similar. Recommended live-traps are those made by Sherman or Tomahawk. The Principle Investigator is responsible for procurement of traps and all other supplies (e.g., GPS units). The decision as to which type of trap to use will be left to the individual park and the preference of the Principle Investigator (snap traps may be used initially when voucher needs are high and live traps later as the percentage of specimens kept for vouchers declines: if density estimates are desired then live traps should be used along with mark-recapture). Linear transects of live-traps or snap traps will be randomly located on a grid that is stratified by habitat type (see above) with the exception of the wet habitats and the prairie dog town at Devils Tower (which receives high visitor use). The Principle Investigator may also trap areas that they identify as potentially adding species to the park list, however, these trap sites need to be noted as being non-random. There will be a minimum of 3 transects per strata. Both types of traps will be baited with rolled oats. When appropriate, traps can be set at habitat features (e.g., logs, trees, burrows), but they should remain within 2m of the station point. Transects will be 150m long. Trap stations will be spaced approximately 15m apart. Traps will be placed in pairs (i.e., two traps per station) to avoid saturation by “trap happy” individuals or species. Following identification and data collection, animals will be released unharmed from live-traps except for those needed for voucher purposes. Live-traps should be checked at least twice daily. Traps will be left out for a minimum of 500 trap-nights per habitat. If after 500 nights per habitat the documented species list is still short of 90% of the expected species list the Principle Investigator shall confer with the Network I&M Coordinator as to whether to continue trapping. Approximately 400 hours will be spent on this task.

The NGP Network will use a combination of mist nets and ultrasonic bat detectors to inventory bats. All of the parks listed above will have bat inventories except for Jewel Cave NM (that park has had prior bat surveys conducted by Bogan [1994] and regularly monitors bat use in the park). Placement of nets will not be randomized or stratified by habitat, rather, expert opinion will be used to identify the sites most likely to capture the species expected to be in the area. Generally speaking, aquatic habitats should be targeted for mist-netting. Nets at riverine sites should be set perpendicular to the shoreline. However, some species are less dependent on aquatic habitats so a variety of other habitats may also be targeted (e.g., openings in the forest). Mist net effort should be quantified based on size and number of nets set and unit effort (i.e., net-nights). At least 4 evenings, with a minimum of 4 hours per event, should be surveyed per strata/park. Approximately 270 hours will be spent preparing for and conducting the surveys.

The use of ultrasonic bat detectors to record bats is becoming more common as the cost of the equipment decreases and the ability to identify species improves. Investigators will use an ultrasonic system to identify bats: the recordings will become the property of the NPS. The Principle Investigator will conduct recordings at sites most likely to support flying bats. The recordings may occur concurrently with the mist net monitoring. At least 4 evenings, with a minimum of 4 hours per event, will be surveyed per strata/park. It is assumed that much of the work will occur concurrently with mist net monitoring, therefore, this task adds only about 80 hours for preparing for the surveys, analyzing the data, and other tasks.

The collection of medium and large mammals for purposes of specimen vouchers, although desirable from a scientific perspective, is often not allowed in national parks for a variety of reasons. The decision of whether to deliberately collect medium and large size mammals for vouchers will be made on a park-by-park basis, and may vary by the species in question. The preferred method of voucher collection for

medium and large size mammals is shooting; however, it is anticipated that this method will not be allowed. Therefore, an acceptable means of documenting species presence is the use of photographs, or the collection of other evidence such as tracks, hair, or fecal material. For all parks, some of this documentation may be collected opportunistically (e.g., road kills). It is anticipated that approximately 10 hours will be spent per park by the investigator to document mid and large size mammals observed incidental to other work. Approximately 100 hours will be spent on this task.

The Northern Great Plains Network has access to 12 automated camera units designed for documenting animal presence and behavior. These will be provided to the Principle Investigator who will use them in a way most appropriate for documenting species not likely to be recorded by the methods listed above. It is expected that they will typically be used with bait and/or lure (depending on the preference of the individual parks) to attract and photograph secretive carnivores and omnivores. Stations will be placed where they are most likely to document the species of interest (i.e., randomization and stratification by habitat will not be used). A minimum of 100 station/nights per park will be invested in this effort. Park and/or NGP Network staff can assist in monitoring the equipment and stations. It is expected that the Principle Investigator will spend 20 hours per park preparing and monitoring the stations, for a cumulative total of 200 hours.

Mammal specimens collected will be frozen, stored, and when requested, shipped directly to the NGP Network Coordinator or other repository identified by the Coordinator. All other materials (see products below) will be shipped to the Network Coordinator. The Network Coordinator will document all data in NRBib, NPSpecies, and the Dataset Catalog. The NGP Network will transform spatial data into GIS formats. The Principle Investigator needs to work closely with the NGP Network Coordinator to ensure that data is recorded in a way that is conducive to these data sets and software applications. The NGP Network Coordinator will ensure that all field inventories that could affect natural or cultural resources will be preceded by a thorough assessment of potential impacts and completion of appropriate compliance documentation. The compliance process will follow guidelines described in the Study Plan and those provided by the WASO office and Director's Orders-12.

PRIMARY REFERENCES:

- Ministry of Environment, Lands and Parks, Resources Inventory Branch. 2001. Species inventory database. Prepared for the Terrestrial Ecosystems Task Force Resources Inventory Committee. Version 2.0. Government of British Columbia. <http://www.elp.gov.bc.ca/rib/wis/spi/>
- Wilson, D. E., F. R. Cole, J. D. Nichols, R. Rudran, and M. S. Foster. 1996. Measuring and monitoring biological diversity: standard methods for mammals. Smithsonian Institution Press, Washington. 409pp.

PRODUCTS:

The Principle Investigator will provide the following products:

- Annual (where applicable) and Final reports (13 copies) for inventories in standard scientific format including an introduction, detailed methodology, results, list of species, and discussion. Analysis of the completeness of the surveys will be included in the report. Reports should be in MS Word format.
- Original field notebooks, notes, and photographs along with accompanying documentation.
- Raw data in MS Access format.
- Spatial data including original rover files, base files and differentially corrected files (if applicable) included on diskette, zip drive or CD, and FGDC compliant metadata (the Principle Investigator should work closely with the Network Coordinator on metadata needs).
- Voucher specimens (3 frozen specimens of each species caught in traps [male, female, juvenile], incidentals [e.g., road kills], photographs, etc.: see the Study Plan for details).

(Note – Data entry into NPSpecies, NPBIB, the Dataset Catalog, and ANCS+ will be performed by the Network Coordinator and/or the Network Data Technician.)

PROJECT SCHEDULE:

May-September 2002. Field inventories will be conducted. The Principle Investigator will work with the Network Coordinator to determine the sequence of parks and inventories conducted. Investigators are encouraged to start the field season at the southernmost parks (i.e., Scotts Bluff NM) and work their way northward

May-September 2003. Balance of field work will be conducted. The Principle Investigator will work with the Network Coordinator to determine the sequence of parks and inventories conducted. Investigators are encouraged to start the field season at the southernmost parks (i.e., Scotts Bluff NM) and work their way northward

December 2003. Principle Investigator submits to the NGP Network Coordinator all products identified above (unless otherwise directed by the NGP Network Coordinator).

PERSONNEL HOURS:

Activity*	FY02	FY03	FY04	Total
Pitfall traps	200	100		300
Snap or live-traps	200	200		400
Mist nets	135	135		270
Ultrasonic bat detectors	40	40		80
Document medium and large mammals	50	50		100
Automated cameras	100	100		200
Study design	120	90		210
Travel between sites	40	40		80
Report writing	40	40	220	300
Miscellaneous	150	150	10	310
Total	1075	945	260	2250

* In addition, the NGP Network will contribute a minimum of 80 hours of personnel time to the field inventories.

BUDGET:

Expense	FY02	FY03	FY04	Total
Principle Investigator	\$25,552	\$24,202	10,350	\$60,104
Supplies*	\$500	\$500	\$100	\$1,100
Vehicle Use (\$0.32 per mile)	\$1,000	\$1,000	\$0	\$2,000
Lodging and per diem	\$2,000	\$2,000	\$0	\$4,000
Indirect Costs (18 %)	\$5,229	\$4,986	\$1,881	\$12,096
Total	\$34,038	\$32,688	\$12,574	\$79,300

* The Principle Investigator is responsible for all supplies (e.g., mist nets, bat detectors, traps, computers, GPS equipment, etc.) except for the automated cameras.

Project was amended in FY03 to add \$4,600 to the FY03 obligation to input data into NPSpecies (i.e., FY03 obligation was \$37,288) and extend the project deadline to September 30, 2004.